

What is claimed is:

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1. A method of recording contents information in a track of an optical disk, comprising the steps of:
- provisionally recording first index information progressively along the track in a predetermined format, the first index information indicating a progression of absolute points or time along the track at a first progression rate;
 - recording the contents information progressively in the track with a second progression rate;
 - generating second index information when the second progression rate is different from the first progression rate determined by the first index information; and
 - adding the second index information into the contents information such that the second index information is written into the track together with the contents information in a format different than the predetermined format.
2. The method according to claim 1, wherein the step of generating generates the second index information having the second progression rate, which is set greater than the first progression rate determined by the first index information.
3. The method according to claim 1, wherein the step of generating generates the second index information having the second progression rate, which is set smaller than the first

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provisionally recorded with first index information in a predetermined format progressively along the track to indicate a progression of absolute points or time of the track at a first progression rate, the apparatus comprising:

a recording section that successively modulates a laser beam by the contents information and irradiates the modulated laser beam onto the optical disk to thereby record the contents information progressively in the track with a second progression rate;

a reproducing section that reproduces the first index information provisionally recorded in the track based on the laser beam reflected from the optical disk;

a generating section that generates second index information when the second progression rate is a multiple of the first progression rate determined by the reproduced first index information; and

a feeding section that feeds the generated second index information to the recording section at a clock rate corresponding to the multiple of the first progression rate, thereby enabling the recording section to write the second index information into the track together with the contents information at the multiple of the first progression rate in a format different than the predetermined format.

6. An optical disk recording apparatus for recording contents information in a track of an optical disk which is provisionally formed with a wobble and which is provisionally

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recorded with first index information in a predetermined format progressively along the track to indicate a progression of absolute points or time of the track at a first progression rate, the apparatus comprising:

a recording section that successively modulates a laser beam by the contents information and irradiates the modulated laser beam into the track while the optical disk is rotated, thereby recording the contents information progressively in the track with a second progression rate;

a detecting section that detects a signal representing the wobble and having a frequency from the laser beam reflected by the optical disk;

a driving section that rotates the optical disk such as to maintain the frequency of the detected signal to a fixed value;

a reproducing section that reproduces the first index information provisionally recorded in the track based on the laser beam reflected from the optical disk;

a generating section that generates second index information when the second progression rate is a multiple of the first progression rate determined by the reproduced first index information; and

a feeding section that feeds the generated second index information to the recording section at a clock rate corresponding to the multiple of the first progression rate, thereby enabling the recording section to write the second index information into the track together with the contents

information at the multiple of the first progression rate in a format different than the predetermined format.

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7. A method of operating on an optical disk having circular tracks which are provisionally written with an index signal used for securing a constant linear velocity of the optical disk from an innermost circular track to an outermost circular track, and recording data along the circular tracks at different linear densities on different annular zones of the optical disk, the method comprising the steps of:

rotating the optical disk while synchronizing the index signal successively read from the rotated optical disk with a predetermined reference clock signal to thereby maintain the constant linear velocity of the circular tracks;

generating different writing clock signals in correspondence to the different annular zones of the optical disk by multiplying or dividing a constant clock signal derived from either of the reference clock signal and the read index signal with different rates; and

recording data along the circular tracks at the different linear densities on the different annular zones in synchronization to the different writing clock signals, while maintaining the constant linear velocity across the different annular zones.

8. The method according to claim 7, wherein the step of recording records data on the different annular zones of the

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optical disk including an inner annular zone and an outer annular zone, and the step of generating generates a first writing clock signal effective to record data on the inner annular zone at a first linear density determined by Compact Disk Standard, and generating a second writing clock signal effective to record data on the outer annular zone at a second linear density which is set higher than the first writing clock signal.

9. The method according to claim 7, wherein the step of generating generates the different writing clock signals having various clock rates, which can be set freely and independently from each other, and which enable recording of data on the different annular zones at the different linear densities freely and independently.

10. An optical disk recording apparatus for operating on an optical disk having circular tracks which are provisionally written with an index signal used for securing a constant linear velocity of the optical disk from an innermost circular track to an outermost circular track, and for recording data along the circular tracks at different linear densities on different annular zones of the optical disk, the apparatus comprising:

a disk drive section that rotates the optical disk while synchronizing the index signal successively read from the rotated optical disk with a predetermined reference clock

signal to thereby maintain the constant linear velocity of the circular tracks;

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a clock generating section that multiples or divides a constant clock signal derived from either of the reference clock signal and the read index signal by different rates to generate different writing clock signals in correspondence to the different annular zones of the optical disk; and

a data recording section that operates in synchronization to the different writing clock signals for recording data along the circular tracks at the different linear densities on the different annular zones while maintaining the constant linear velocity across the different annular zones.

11. The optical disk recording apparatus according to claim 10, wherein the data recording section records data on the different annular zones of the optical disk including an inner annular zone and an outer annular zone, and the clock generating section generates a first writing clock signal effective to enable the data recording section to record data on the inner annular zone at a first linear density determined by Compact Disk Standard, and generates a second writing clock signal effective to enable the data recording section to record data on the outer annular zone at a second linear density which is set higher than the first writing clock signal.

12. The optical disk recording apparatus according to claim 10, wherein the clock generating section generates the different writing clock signals having various clock rates, which can be set freely and independently from each other, and which enable the data recording section to record data on the different annular zones at the different linear densities freely and independently.

13. An optical disk reproducing apparatus for operating on an optical disk having circular tracks which are recorded with data at different linear densities on different annular zones of the optical disk, and for reproducing the data successively from access points along the circular tracks, the apparatus comprising:

a disk drive section that rotates the optical disk at a constant angular velocity while successively reading the data from the access points;

a clock rate computing section that periodically acquires information concerning a current access point of the optical disk and information concerning a linear density of the data at the current access point, and that computes a reading clock rate based on the acquired information and provisional information concerning the constant angular velocity of the disk; and

a data reproducing section that operates according to the computed reading clock rate for successively reproducing the data from the access points at the computed

reading clock rate.

14. A method of recording data on an optical disk, comprising the steps of:

provisionally writing an index signal along circular tracks arranged from an innermost circular track to an outermost circular track on the optical disk, the index signal being used for controlling a linear density of data when recording data along the circular tracks;

recording data on different annular zones of the optical disk at different linear densities based on the index signal; and

changing gradually one linear density to another linear density when the recording of the data is switched from one annular zone to another annular zone adjacent to the one annular zone.

15. The method according to claim 14, wherein the step of recording comprises the steps of dividing the optical disk into an inner annular zone and an outer annular zone, and recording the data on the inner annular zone at a default linear density and recording the data on the outer annular zone at a high linear density which is set higher than the default linear density.

16. The method according to claim 15, wherein each of the inner annular zone and the outer annular zone has a

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sequence of a leadin area, a program area and a leadout area, such that the step of changing gradually raises the default linear density to the high linear density between a top of the leadout area of the inner annular zone and an end of the leadin area of the outer annular zone.

17. The method according to claim 16, wherein the step of changing gradually raises the default linear density to the high linear density within the leadout area of the inner annular zone.

18. An optical disk recording apparatus for operating on an optical disk having circular tracks which are provisionally written with an index signal used for controlling a linear density of data when recording data along the circular tracks, and for recording data at different linear densities on different annular zones of the optical disk, the apparatus comprising:

a disk driving section that rotates the optical disk;

a pickup device that reads out the index signal from the optical disk and writes data into the optical disk while the optical disk is rotated by the disk driving section;

a clock generating section that operates based on the index signal read from the optical disk through the pickup device for generating a writing clock signal effective to control recording of data;

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a recording control section that operates according to the writing clock signal for controlling the pickup device to record data on different annular zones at different linear densities; and

a transition control section that operates when the recording of the data is switched from a first annular zone at a first linear density to a second annular zone adjacent to the first annular zone at a second linear density different from the first linear density for gradually changing the first linear density to the second linear density by regulating either of a rotating velocity of the optical disk and a bit rate of the writing clock signal.

19. The optical disk recording apparatus according to claim 18, wherein the transition control section controls the clock generating section to regulate the bit rate of the writing clock signal for effecting a gradual transition of the first linear density to the second linear density.

20. An optical disk having data recorded by the steps of:

provisionally writing an index signal along circular tracks arranged from an innermost circular track to an outermost circular track on the optical disk, the index signal being used for controlling a linear density of data when recording data along the circular tracks;

recording data on different annular zones of the

optical disk at different linear densities based on the index signal; and

changing gradually one linear density to another linear density when the recording of the data is switched from one annular zone to another annular zone adjacent to the one annular zone.

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